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Is asthma underestimated as a cause of sick leave?

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Public interest needs to be focused on the economic burden of asthma on society because of the increasing prevalence of the condition. Asthma is common in individuals of working age and sick leave is an important health-economic issue. In the present study we looked at the prevalence of asthma in a sick leave register. Individuals on sick leave due to asthma, individuals on sick leave due to any other respiratory disorder or symptom and individuals on sick leave due to non-respiratory conditions were included in a questionnaire based study. Individuals in the register diagnosed with asthma could be classified as current asthmatics or possible asthmatics in respectively 94% and 99% of the cases. They were also ex-smokers to a greater extent than the other groups, which was more pronounced in males. However, individuals on sick leave due to 'any other respiratory disorder' could be classified as current asthmatics or possible asthmatics in respectively 19% and 30% of the cases. The corresponding figures in the group on sick leave due to 'other diagnoses' were 7% and 10%. Hence, there is evidence that asthma is an under-reported diagnosis and this must be taken into consideration when sick leave registers are used in health-economic studies.

Key words: cost of illness; healthcare costs; registers; signs and symptoms, respiratory; smoking cessation.

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Introduction

The economic burden of asthma on society is increasing and since asthma is common in individuals of working age, it is important to study the cost of sick leave to society (1–5). In Sweden, there is a rare opportunity of studying the magnitude of sick leave due to asthma because of the availability of a large sick-listing database, Collective Bargaining Group Sickness Insurance, AGS (in Swedish: Avtalsgruppsjukförsäkring).

The aims of the present study were (a) to determine the proportion of sick leave due to asthma and other airway diagnoses in relation to all registered sick leaves in the AGS register, (b) to estimate the prevalence of asthma and asthmatic symptoms in a population registered for sick leave due to asthma, other respiratory diagnoses and non-respiratory diagnoses and (c) to elucidate the smoking habits among individuals on sick leave.

Materials and methods

THE AGS REGISTER

AGS is a compulsory insurance paid for by the employer for 2.4 million employees in Sweden. These employees are mainly manual labourers in the public and private sector and constitute around 60% of the total Swedish work force. The insurance partly compensates for income loss due to sick leave from the 15th day up to the 90th day. In the AGS register, sex, age, area of residence, employer and type of occupation are recorded, and the diagnoses are entered using a modified ICD coding system. The airway diagnoses used are 'asthma', 'bronchitis', 'allergy/rhinitis' and 'respiratory disorders'. The group 'respiratory disorders' mainly consists of sick leave periods due to respiratory tract infections. Tumours have a separate code and are not included in 'respiratory disorders'. The diagnostic coding in the AGS register is based on the diagnosis on the certificates of illness issued by physicians.

All sick leaves registered in the AGS register during 1992–1994 were selected for a further study. Sick leave periods lasting longer than 14 days during this period were analysed for 1.2 million employees in the private sector, around 30% of the total Swedish work force, of whom 65% were males.

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STUDY POPULATION — QUESTIONNAIRE STUDY

Individuals under 56 years of age registered in the AGS with a sick leave period starting in 1994 were included in a questionnaire study. This age group was chosen to minimize symptoms caused by chronic obstructive pulmonary disease (COPD), which are more prevalent in older age groups. A validated questionnaire was sent to three groups of people in the AGS register: (a) individuals registered with a diagnosis of asthma ($n=205$), (b) individuals registered with any other respiratory diagnosis ($n=1762$) and (c) a random sample of 8% of all individuals registered under any other diagnosis ($n=5813$).

The questionnaires were posted in 1995. Two reminders were posted to non-responders.

Questionnaire

The questionnaire used in this study was based on the OLIN studies questionnaire (6), which was developed from a British Medical Research Council (BMRC) questionnaire (7) with modifications by the American Thoracic Society (ATS) (8) and the Tucson Group (9,10). The questionnaire has been validated in Sweden (11) and used in northern European studies (12–14). It contains questions concerning respiratory symptoms and diseases, and smoking habits. The respiratory symptoms included long-standing cough, productive cough, recurrent wheezing and asthmatic symptoms during the past year. The subjects were also asked if a physician had diagnosed them as having asthma, if they considered themselves to have or have had asthma, or if they were using any anti-asthmatic medications. The answers required were either 'Yes' or 'No'.

DEFINITIONS

'Probable asthma' was defined as existing in those who reported that they had been diagnosed with asthma by a physician or those who reported that they considered themselves to have or to have had asthma.

'Asthmatic symptoms' were defined as existing in those who reported periodic or episodic attacks of shortness of breath during the past year.

'Respiratory symptoms' were defined as existing in those reporting long-standing cough, productive cough, recurrent wheeze or asthmatic symptoms.

'Current asthma' was defined as probable asthma together with either current use of asthma medications or reported respiratory symptoms.

'Possible asthma' was defined as either current asthma defined as above or (a) use of asthma medications together with reporting of respiratory symptoms or (b) reporting of recurrent wheeze and asthmatic symptoms during the last year.

'Ex-smokers' were defined as persons having stopped smoking more than 12 months previously.

ANALYSIS

The data collected were analysed statistically using SPSS (Statistical Products and Service Solutions) for Windows, release 8.0.2. Differences between groups were compared using 95% confidence intervals (CI).

The estimated total number of persons with self-reported asthma in each sick leave category was calculated as the crude prevalence rate in the samples times the total number of registered persons in each category.

Results

REGISTER STUDY

During 1992–1994 the total number of registered sick leave periods in the AGS was 221 249. Only 0.47% of them comprised a diagnosis of asthma. The other airway diagnoses accounted for 3.56%. The asthma group and the group registered for any other airway diagnoses included significantly more men than the group with other diagnoses (Table 1). Asthma accounted for 0.48%, and the other airways diagnoses for 2.57% of the compensated days, which totalled, 12 839 321. The median number of compensated days was more than doubled for individuals registered with a diagnosis of asthma (62 days) compared

TABLE 1. Number of subjects, proportion of men, median number of compensated days and proportion of sick leaves of 90 days or longer

	No	Men		Compensated days		Sick leave, 90 days or longer	
		%	95% CI	Median no.	Quartiles	%	95% CI
Asthma	1041	52.6	49.6–55.7	62	28 ; 90	40.4	37.5–43.4
Other airway diagnoses	7868	55.6	54.5–56.7	30	21 ; 57	16.5	15.7–17.3
Other diagnoses	213 340	61.0	60.8–61.2	56	32 ; 90	34.0	33.8–34.2
Totals	221 249	60.8	60.6–61.0	55	31 ; 90	33.4	33.2–33.6

TABLE 2. Participants in the questionnaire study (response rates, gender, age, and smoking habits)

	No.	Resp. rate		Men		Age		Smokers		Ex-smokers	
		%		%	95% CI	Median	Quartiles	%	95% CI	%	95% CI
Asthma diagnosis	205	88.8		54.9	47.7–62.2	45	34 ; 52	21.1	15.1–27.1	41.1	33.9–48.3
Other airway diagnoses	1762	80.2		54.9	52.3–57.5	43	34 ; 51	34.6	32.1–37.1	27.9	25.5–30.2
Other diagnoses	5813	84.0		61.3	60.0–62.7	42	33 ; 50	36.7	35.3–38.0	24.3	23.1–25.5
Totals	7780	83.3		59.7	58.8–60.9	42	33 ; 50	35.8	34.6–37.0	25.5	24.5–26.6

with persons on sick leave due to other airway diagnoses (30 days). This was also reflected in the proportion of sick leave periods exceeding 90 days, which was significantly higher for individuals diagnosed with asthma than for the other groups (Table 1).

QUESTIONNAIRE STUDY

Participation

A total of 7780 questionnaires were sent out. The overall response rate was 83% and persons registered with a diagnosis of asthma had the highest response rate (Table 2). The median age was 42 years and the mean age was 41 years, with small variations between the groups. In the group on sick leave due to asthma or due to any other airway diagnosis there were slightly less men than in the group on sick leave due to any other diagnosis (Table 2).

Smoking habits

The proportions of non-smokers were similar in the three groups, but the proportion of smokers was significantly lower for the asthma group (Table 2). Men were ex-smokers to a greater extent than women were, 28.8% (95% CI = 27.4–30.2) vs. 20.7 (95% CI = 19.1–22.2).

Respiratory symptoms and diseases

Individuals who were reported to the AGS register with a diagnosis of asthma were classified as having current asthma or possible asthma respectively in 94.0% and 98.9% of the cases. Persons with other airway diagnoses were classified as having current asthma or possible asthma in respectively 19.0% and 30.1% of the cases. The corresponding figures for the group on sick leave due to any other diagnoses were 6.7% and 9.9%. No major differences were found between men and women or when the prevalence rates were standardized for age or sex (Table 3). Among individuals on sick leave due to a non-respiratory diagnosis, the prevalence of probable asthma and current asthma was significantly higher for individuals, aged 18–39 than for those aged 40–56 years. In the other

sick leave groups the prevalence rates of self-reported respiratory symptoms and diseases tended to be higher in the older age groups (Table 3).

The greatest number of individuals with asthma, on estimating the number of individuals with asthma according to the postal questionnaire, was found among individual on sick leave due to a non-respiratory diagnosis (Table 4). The vast majority of individuals with current asthma or possible asthma on sick leave due to respiratory symptoms were registered under an airway diagnosis other than asthma.

Discussion

Asthma is a common disease in individuals of working age and therefore sick leave is an important health-economic issue. Long-term sick leave (i.e. periods of longer than 90 days) is costly for society and periods of sick leave lasting from 15 to 90 days constitute a valuable tool for identifying areas of concern.

In the questionnaire part of our study well over 90% of those registered with a diagnosis of asthma were classified as having current asthma or possible asthma. Therefore, it can be concluded that when asthma is stated on the certificate of illness, it is a valid diagnosis for persons 56 years of age or younger. However, in the group on sick leave due to any other airway diagnoses, 19% were classified as having current asthma and 30% as having possible asthma. For the age group studied, the total number of persons with asthma on sick leave due to any respiratory symptom was therefore approximately three times larger than the number of persons registered with a diagnosis of asthma.

In the register part of our study, asthma appears to be a relatively rare cause of sick leave periods longer than 14 days, constituting only 0.5% of the reported number of periods and 0.5% of the compensated days. In a health-economic report on cost due to asthma in Sweden (15), it was calculated that asthma accounted for 0.55% of all sick leave days in Sweden in 1991. In the questionnaire part of our study, however, we found that asthma is under-reported and this implies that the cost to society for asthma in Sweden is underestimated. One possible reason for the under-reporting of asthma is that the cause of the asthmatic exacerbation (respiratory tract infection) is stated

TABLE 3. Asthma and respiratory symptoms [Crude prevalence rates (totals and in age groups), age- and sex-standardized rates in different sick leave groups]

	Probable asthma		Asthmatic symptoms		Respiratory symptoms		Current asthma		Possible asthma	
Asthma diagnosis										
Crude % (95% CI)	94.5	(91.1–97.8)	96.2	(93.4–98.9)	97.8	(95.7–99.9)	94.0	(90.5–97.4)	98.9	(97.4–100)
Aged 18–39	93.2	(87.5–99.0)	97.3	(93.6–100)	98.6	(96.0–100)	93.2	(87.5–99.0)	98.6	(96.0–100)
Aged 40–56	95.3	(91.3–99.3)	95.4	(91.4–99.3)	97.2	(94.1–100)	94.4	(90.1–98.8)	99.1	(97.3–100)
Age–std %	94.3	.	95.2	.	96.9	.	93.9	.	98.8	.
Sex–std %	94.5	.	95.9	.	97.6	.	94.1	.	98.8	.
Other airway diagnoses										
Crude % (95% CI)	19.6	(17.6–21.7)	33.0	(30.5–35.4)	58.6	(56.0–61.1)	19.0	(16.9–21.0)	30.1	(27.7–32.4)
Aged 18–39	18.0	(14.8–21.3)	29.4	(25.6–33.3)	56.7	(52.5–60.9)	17.5	(14.3–20.7)	27.5	(23.7–31.3)
Aged 40–56	20.6	(17.9–23.3)	35.1	(32.0–38.3)	59.7	(56.5–63.0)	19.9	(17.2–22.5)	31.6	(28.5–34.7)
Age–std %	19.6	.	32.8	.	58.5	.	19.0	.	30.0	.
Sex–std %	19.5	.	32.8	.	58.3	.	18.8	.	29.8	.
Other diagnoses										
Crude % (95% CI)	7.4	(6.6–8.1)	9.1	(8.3–9.9)	24.9	(23.7–26.1)	6.7	(6.0–7.4)	9.9	(9.0–10.7)
Aged 18–39	8.8	(7.6–10.1)	10.0	(8.7–11.3)	24.7	(22.9–26.6)	8.1	(7.0–9.3)	10.9	(9.6–12.2)
Aged 40–56	6.2	(5.3–7.1)	8.5	(7.4–9.5)	25.0	(23.4–26.6)	5.6	(4.8–6.5)	9.1	(8.0–10.1)
Age–std %	7.3	.	9.1	.	24.9	.	6.7	.	9.8	.
Sex–std %	7.4	.	9.2	.	24.9	.	6.7	.	9.9	.

TABLE 4. Estimated number of persons reporting asthma in the different sick leave groups

Registered diagnosis	No. of sick leave periods	Asthma categories according to the postal questionnaire	
		Current asthma (no.)	Possible asthma(no.)
Asthma diagnosis	205	193	203
Other airway diagnoses	1762	335	530
Other diagnoses	72 663	4868	7194

on the sick leave certificate instead of asthma *per se*. Another more important reason for the under-reporting is that many individuals on sick leave due to respiratory symptoms have undiagnosed asthma. In large Swedish epidemiological studies, using the same questionnaire as in the present study, between one third and two thirds of those classified as asthmatics have previously, by a doctor, been diagnosed as having asthma (16,17). Some persons with asthma might also have had sick leave periods due to respiratory causes not at all related to their asthma, for instance, pneumonia and pleurisy. Persons on sick leave registered with a diagnosis of asthma had longer sick leave periods and a higher proportion of sick leaves of 90 days or longer compared with individuals on sick leave due to any other respiratory symptom. This could indicate that individuals who have asthma, according to our definitions, but are on sick leave due to an airway diagnosis other than asthma have milder forms of asthma.

The largest numbers of individuals with asthma are found among those with non-respiratory sick leave diagnoses. Most individuals with asthma are treated effectively and never have sick leave periods longer than 14 days due to respiratory symptoms. The prevalence of probable asthma and current asthma in the group with non-respiratory diagnoses were of the same magnitude as in recent Swedish cross-sectional studies (6,16,18).

Smoking habits varied greatly between the sick leave groups in our study. Fewer smokers, but more ex-smokers, were found in the group with a diagnosis of asthma than in the other two groups. This either indicates that individuals with asthma have stopped smoking in order to decrease their symptoms or that ex-smokers are more prone to develop asthma (19). Men, especially those registered with a diagnosis of asthma, were ex-smokers to a greater extent than women. This gender difference in smoking cessation is in accord with other studies (20–22).

The age limit in the present study was set at 56 years in order to minimize the influence of chronic obstructive pulmonary disease (COPD) on airway symptoms. Among those on sick leave due to a non-respiratory diagnosis, the prevalence of asthma was higher in the younger age group. Such age differences in the prevalence of asthma-related disorder has previously been described (18,23). Among those on sick leave with a respiratory diagnosis, a minor increase in the prevalence of asthma was found in

individuals 40 years or older compared with the younger age group. This could indicate that some individuals with COPD on sick leave due to respiratory symptoms may have been wrongly classified as having asthma. This merely reflects the difficulties in differentiating between asthmatic symptoms and symptoms related to COPD (24,25). However, such misclassification would only have had minor effects on the main results. A certain amount of recall bias might have occurred in our study and hence given an underestimation of the prevalence rates. The questionnaire was sent out between 5 and 17 months after a registered sick leave period. Individuals without any ongoing respiratory symptoms at the time of completing the questionnaire could have under-reported asthma and asthmatic symptoms. Apart from what has been discussed above regarding possible confounding from COPD and recall bias, the internal validity of this study must be considered good. A validated questionnaire was used. All sick leave due to respiratory causes during the study period were included and the sample of other diagnoses was large. The external validity of the results is more questionable but one might suspect that under-reporting of asthma is a common feature in all sick leave registers. We conclude that when asthma is registered as a cause for sick leave, it is a valid diagnosis and that asthma is an underdiagnosed disorder in a sick leave register. We have also found that persons registered with a diagnosis of asthma tend to have long sick leave periods and are ex-smokers to a greater extent than persons with other reasons for sick leave.

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